

Problems

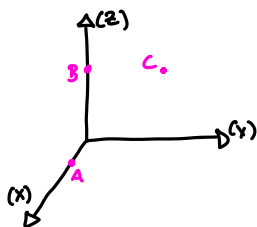
32.P.4)

$$V_z = 2.0 \times 10^7 \text{ m/s}$$

a.) $(1\text{cm}, 0\text{cm}, 0\text{cm})$

b.) $(0\text{cm}, 0\text{cm}, 1\text{cm})$

c.) $(0\text{cm}, 1\text{cm}, 1\text{cm})$



a.) $\vec{B}_a = \frac{\mu_0}{4\pi} \frac{q \vec{v} \times \vec{r}}{r^2}$

$\langle 0.01\text{m}, 0\text{m}, 0\text{m} \rangle$

$\vec{u}_p = \langle 1\text{m}, 0, 0 \rangle$

$\mu_0 = 4\pi \times 10^{-7}$

$\vec{v} = \langle 0, 0, 2.0 \times 10^7 \text{ m/s} \rangle$

$\vec{r} = \langle 1\text{m}, 0, 0 \rangle$

$r = 0.01\text{m}$

$$\vec{B}_a = \frac{\mu_0}{4\pi} \frac{-1.602 \times 10^{-19} \text{ C} (2.0 \times 10^7 \text{ m/s} \hat{k} \times 1\text{m} \hat{i})}{(0.01\text{m})^2}$$

$$\vec{B}_a = 3.204 \times 10^{-15} \text{ T } \hat{j}$$

b.) $\vec{B}_b = \frac{\mu_0}{4\pi} \frac{q \vec{v} \times \vec{r}}{r^2}$

$\mu_0 = 4\pi \times 10^{-7}$

$\vec{v} = \langle 0, 0, 2.0 \times 10^7 \text{ m/s} \rangle$

$\vec{r} = \langle 0, 0, 1\text{m} \rangle$

$r = 0.01\text{m}$

$$\vec{B}_b = \frac{\mu_0}{4\pi} \frac{-1.602 \times 10^{-19} \text{ C} (2.0 \times 10^7 \text{ m/s} \hat{k} \times 1\text{m} \hat{k})}{(0.01\text{m})^2}$$

$$\vec{B}_b = 0 \text{ T}$$

c.) $\vec{B}_c = \frac{\mu_0}{4\pi} \frac{q \vec{v} \times \vec{r}}{r^2}$

$\mu_0 = 4\pi \times 10^{-7}$

$\vec{v} = \langle 0, 0, 2.0 \times 10^7 \text{ m/s} \rangle$

$\vec{r} = \langle 0, \frac{0.01\text{m}}{0.01414}, \frac{0.01\text{m}}{0.01414} \rangle$

$r = 0.01414$

$$\vec{B}_c = \frac{\mu_0}{4\pi} \frac{-1.602 \times 10^{-19} \text{ C} (2.0 \times 10^7 \text{ m/s} \times \frac{0.01\text{m}}{0.01414} \hat{j} + \frac{0.01\text{m}}{0.01414} \hat{k})}{(0.01414\text{m})^2}$$

$$\vec{B}_c = -1.13 \times 10^{-15} \text{ T } \hat{i}$$

$$\begin{aligned} \vec{B}_a &= -3.204 \times 10^{-15} \text{ T } \hat{j} \\ \vec{B}_b &= 0 \text{ T} \\ \vec{B}_c &= -1.13 \times 10^{-15} \text{ T } \hat{i} \end{aligned}$$

39.P.5

$$\vec{B}_a = \frac{\mu_0}{4\pi} \frac{q(\vec{v} \times \hat{r})}{r^2}$$

$$\mu_0 = 4\pi \times 10^{-7}$$

$$q = 1.6 \times 10^{-19} \text{ C}$$

$$\vec{r} = 0.044 \langle -0.01, 0.01, 0 \rangle$$

$$r = 0.044$$

$$\vec{v} = \langle -2.0 \times 10^7 \text{ m/s}, 0, 0 \rangle$$

$$\vec{B}_a = \frac{\mu_0}{4\pi} \frac{1.6 \times 10^{-19} \text{ C} (-2.0 \times 10^7 \text{ m/s} \hat{x} \times \frac{-0.01 \text{ m}}{0.04} \hat{y} + \frac{0.01 \text{ m}}{0.04} \hat{z})}{(0.044)^2}$$

$$\vec{B}_a = -1.13 \times 10^{-5} \text{ T } \hat{k}$$

32.P.6

$$\vec{B}_e = \frac{\mu_0}{4\pi} \cdot \frac{q(\vec{v} \times \vec{r})}{r^2}$$

$$\mu_0 = 4\pi \times 10^{-7}$$

$$q = 1.602 \times 10^{-19} \text{ C}$$

$$\vec{v} = \langle 0, 2.0 \times 10^7 \text{ m/s}, 0 \rangle$$

$$\vec{r} = \langle -0.2 \text{ m}, -0.2 \text{ m}, 0 \rangle$$

$$r = 0.028284$$

$$(1,1) \quad \vec{r} = \langle -0.02 \text{ m}, -0.02 \text{ m}, 0 \rangle$$

$$(1,1) \quad r = 0.028284$$

$$\vec{B}_e = \frac{\mu_0}{4\pi} \cdot \frac{1.602 \times 10^{-19} \text{ C} (2.0 \times 10^7 \text{ m/s} \hat{j} \times \frac{-0.02 \text{ m}}{0.0282} \hat{i} - \frac{0.02 \text{ m}}{0.0282} \hat{j})}{(0.028284)^2}$$

$$\vec{B}_e = 2.83 \times 10^{-16} \hat{k} \text{ T}$$